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High statistics measurement of K_{e4} decay properties S. Pislak[7,6], R. Appel[6,3], G.S. Atoyan[4], B. Bassalleck[2], D.R. Bergman[6]DB, N. Cheung[3],
[1]Brookhaven National Laboratory, Upton L. I., NY 11973, USA

abstract We report experimental details and results of a new measurement of the decay $K^+ \to \pi^+\pi^- e^+\nu_e$ (K_{e4}). A sample of more than 400,000 K_{e4} events with low background has been collected by Experiment 865 at the Brookhaven Alternate Gradient Synchrotron. From these data, the branching ratio $(4.11 \pm 0.01 \pm 0.11) \cdot 10^{-5}$ and the $\pi\pi$ invariant mass dependence of the form factors F, G, and H of the weak hadronic current as well as the phase shift difference $\delta_0^0 - \delta_1^1$ for $\pi\pi$-scattering were extracted. Using constraints based on analyticity and chiral symmetry, a new value with considerably improved accuracy for the s-wave $\pi\pi$-scattering length a_0^0 has been obtained also: $a_0^0 = 0.216 \pm 0.013\,(\text{stat.}) \pm 0.002\,(\text{syst.}) \pm 0.002\,(\text{theor.})$.